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INTRODUCTION OF THE FIFTH GENERATION COMPUTER SYSTEMS

The Fifth Generation Computer Systems will be a knowledge information processing system based on the innovative theories and technologies that can offer advanced functions expected to be required in the 1990's, overcoming technical restriction inherent to conventional computers.

1. Basic Concept

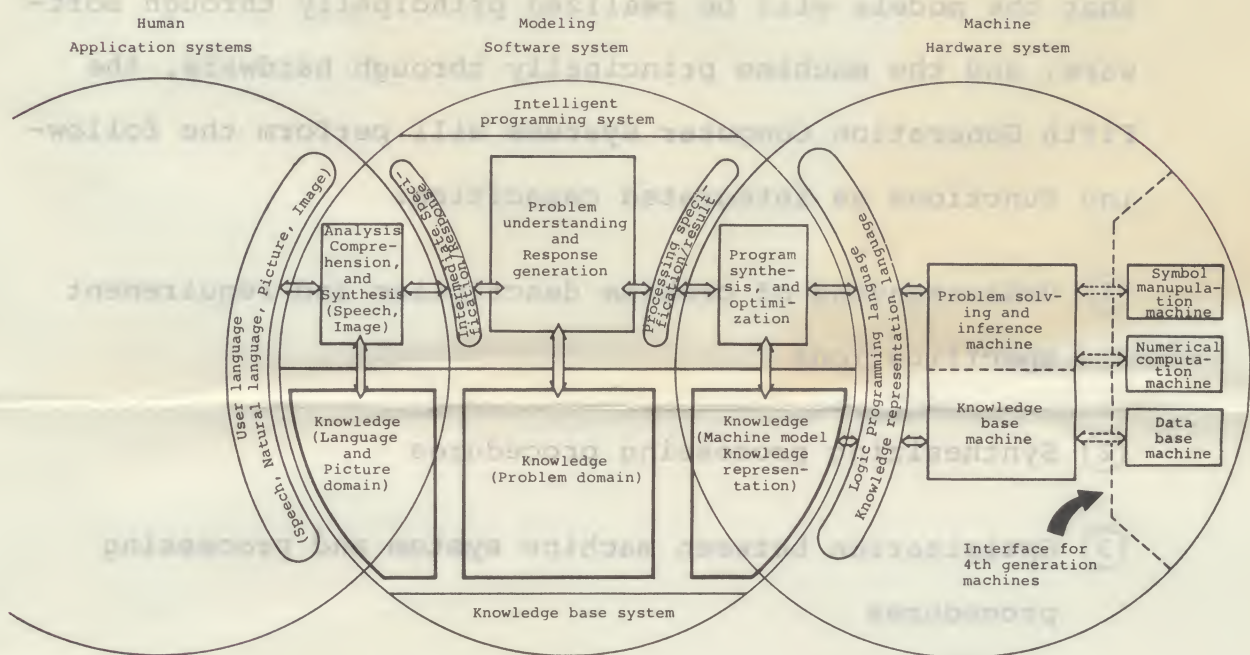


Fig. 1 Concept Diagram of
the Fifth Generation Computer Systems

The Fifth Generation Computer Systems are knowledge information processing systems having problem-solving functions of very high level. In those systems, intelligence will be greatly improved and step up to human being, and, when compared with conventional systems, the man-machine interface will become closer to the human system. Figure 1 shows a conceptual diagram of the Fifth Generation Computer Systems. As shown in the figure, a powerful problem-solving mechanism based on problem understanding and inference functions, knowledge bases, etc. are found between human system and conventional machine functions. In addition to that the models will be realized principally through software, and the machine principally through hardware, the Fifth Generation Computer Systems will perform the following functions as integrated capacities:

- ① Understanding of problem description and requirement specifications
- ② Synthesizing processing procedures
- ③ Optimization between machine system and processing procedures
- ④ Synthesizing response based on outputs from machine system

- ⑤ Intelligent interface functions capable of understanding speech, image and natural language, etc.

The knowledge bases that support the above functions will contain knowledge of the following types:

- ① Knowledge of the languages to be used for man machine communication
- ② Knowledge on the problem areas to be solved
- ③ Knowledge on the machine systems

2. Constituent Elements of Software System

Figure 2 shows the system configuration image.

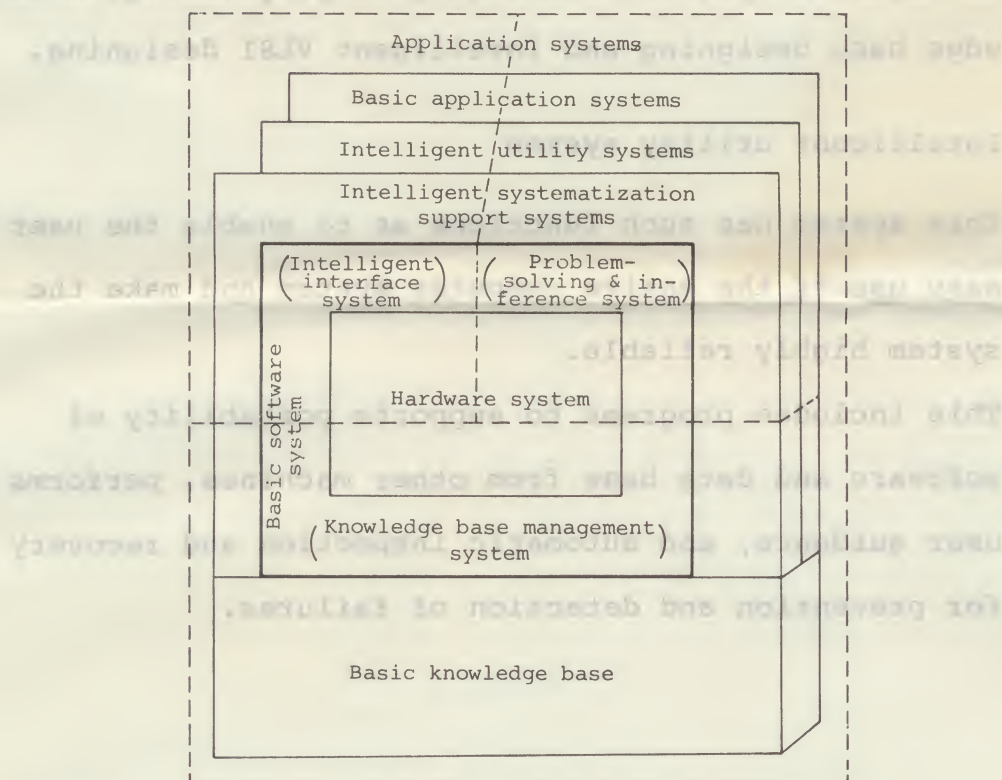


Fig. 2 Configuration of the Fifth Generation Computer Software System

These constituent elements perform the following functions.

(1) Basic software system

Basic software system forms the core of the software system, and consists of the three subsystems of Problem-solving and inference, knowledge base management and Intelligent interface which are the basic functions of the Fifth Generation Computer Systems.

(2) Intelligent systematization support system

This system provides the human designer intelligent functions to strongly support systematization work based on the knowledge base contents and it consists of three subsystems of Intelligent programming, Knowledge base designing and Intelligent VLSI designing.

(3) Intelligent utility system

This system has such functions as to enable the user easy use of the entire computer system and make the system highly reliable.

This includes programs to supports portability of software and data base from other machines, performs user guidance, and automatic inspection and recovery for prevention and detection of failures.

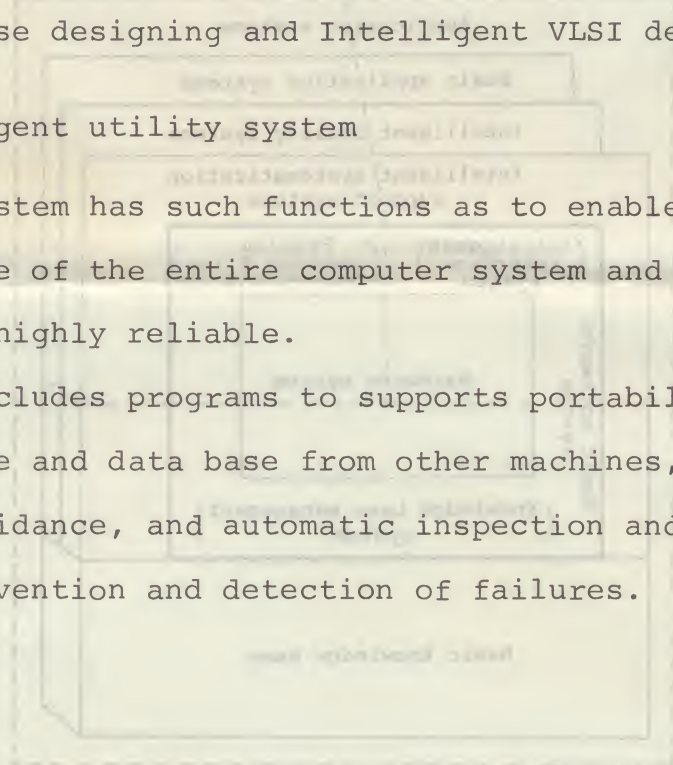


Fig. 3 Configuration of the Fifth Generation Computer System

(4) Basic knowledge base

The basic knowledge base contains accumulation of knowledge that is effective and also general to users, as well as supporting the operation of the entire system. Generally, there are three types; general knowledge base that mainly relates to understanding natural languages, system knowledge base related to the system itself and applied knowledge base containing various knowledge like human experts.

(5) Basic application system

The following type basic application systems can be thought of:

- Machine translation system
- Question-answering system
- Applied speech understanding system
- Applied picture and image understanding system
- Applied problem solving system

(6) Application systems

The following system can be thought of as examples of knowledge information processing application systems:

- Intelligent CAE/CAD system (Note 1)
- Intelligent CAI system
- Intelligent OA system

3. Configuration Image of Hardware System

The Fifth Generation Computer Systems will take the form all performance levels, from small to large scale machines, to process diversified applications. The machines of all performance levels must have common languages as well as the following three basic functions: The remarks in parentheses indicate the correspondence with conventional computer systems.

- ① Problem-solving and inference machine (Central processing unit)
- ② Knowledge base machine (Main memory with virtual memory facilities and file system)
- ③ Intelligent interface machine (Input/output channels and Input/output devices)

(Note 1) CAE: Computer Aided Engineering
 CAD: Computer Aided Design
 CAI: Computer Assisted Instruction
 OA: Office Automation

There will be machines of several performance level in each of these small to large computer systems, to permit configuring the system emphasized any function from the levels by application or purpose of use.

Figure 3 shows a configuration image of the Fifth Generation Computer Systems. The machines by function are to be structured on various new architectures including a data flow machine, which are based on VLSI architecture and each system is to be a combination of machines suitable for the individual application or need.

Furthermore, it is envisioned as a usage form from a macro configuration viewpoint that multiple systems as shown in the figure are connected to a local or global network and the whole network is used as a large scale distributed processing system.

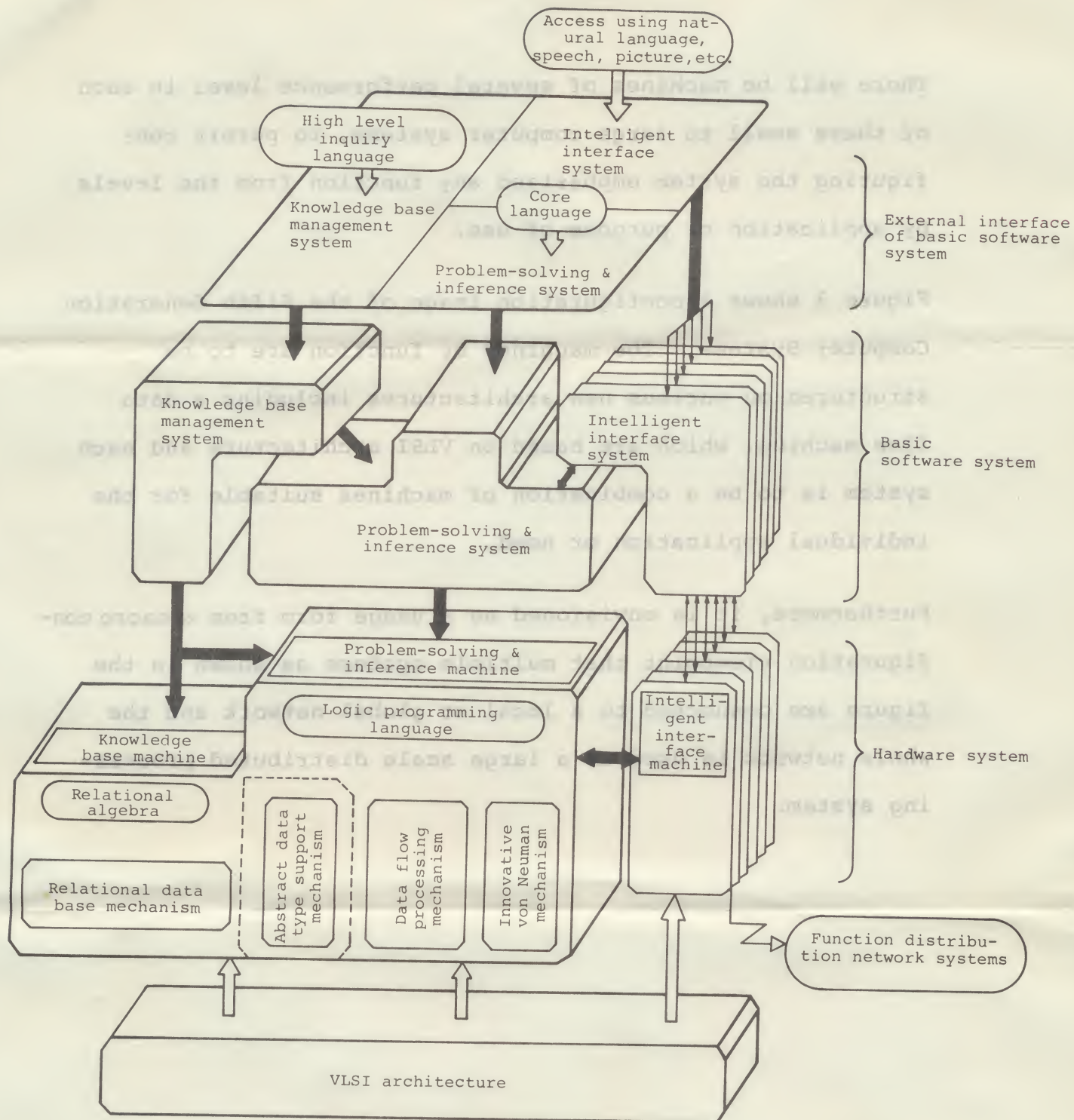


Fig. 3 Basic Configuration of the Fifth Generation Computer Systems